IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of **Fulghum,** et al.	Patent Pending
Serial No.: **10/720,492**	Examiner: Mr. Kevin Burd
Filed: **24 November 2003**	Group Art Unit: 2611
For: **Method and Apparatus for DS-CDMA Interference Suppression Using Code-Specific Combining**	Confirmation No.: 4554

Attorney's Docket No: **4015-5133**

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Kathleen Koppen

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Dear Sir or Madam:

This appeal brief is timely filed within one month of the Office's 7 May 2008 mailing of the Notice of Panel Decision from Pre-Appeal Brief review. Thus, no extension-of-time fees should be required for its entry. Concurrently with this electronic submission, the applicants submit payment of $510.00 to cover the appeal brief fee. If any further fees or charges are required, the Commissioner is hereby authorized to charge them to Deposit Account 18-1167.

APPEAL BRIEF

(I.) REAL PARTY IN INTEREST

The real party of interest isTelefonaktiebolaget LM Ericsson (publ).

(II.) RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences to the best of the applicants' knowledge.

(III.) STATUS OF CLAIMS

Claims 1, 2, 4 – 6, 8, 9, 11 -13, 15 – 17, and 19 – 89 stand rejected by the examiner. Accordingly, the applicants appeal the rejection of claims 1, 2, 4 – 6, 8, 9, 11 -13, 15 – 17, and 19 – 89.

(IV.) STATUS OF AMENDMENTS

All amendments have been entered to the best of Applicants' knowledge.

(V.) SUMMARY OF CLAIMED SUBJECT MATTER

Claims 1, 2, 4 – 6, 8, 9, 11 -13, 15 – 17, and 19 – 89 are pending in the instant application. These claims include independent claims 1, 5, 8, 12, 16, 21, 24, 28, 32, 49, 67, 77, and 83 generally directed to reducing intersymbol interference in a symbol of interest. To that end, the claimed invention uses code cross-correlations to process unknown symbols received over multiple paths of a multi-path channel. None of the dependent claims are written in means-plus-function form. Thus, per 37 CFR 41.37(c)(1)(v), a separate summary of the dependent claims is not required.

A. Independent Claim 1

Independent claim 1 claims a RAKE receiver 200 comprising a plurality of RAKE fingers 220, a processor 230, and a combiner 232. See, for example, Figure 2 and p. 6, line 11 to p. 11, line 12. RAKE fingers 220 despread unknown symbols received over multiple paths of a multi-path channel. See, for example, p. 5, ll. 6 – 8 and p. 6, ll. 14 – 15. One RAKE finger 220 comprises a delay 222 corresponding to an unknown symbol of interest. Another RAKE finger

220 comprises a delay 222 corresponding to an unknown interfering symbol. See, for example, p. 6, ll. 15 – 18. Processor 230 determines cross-correlations between the symbol of interest and the interfering symbol based on code cross-correlations between spreading codes for the symbol of interest and the interfering symbol. See, for example, p. 6, ll. 21 – 23, and p. 8, line 7 to p. 11, line 12. Combiner 232, i.e., a RAKE combiner, combines the symbol of interest with the interfering symbol using the cross-correlations to reduce the intersymbol interference attributable to the interfering symbol from the symbol of interest. See, for example, p. 6, ll. 18 – 23.

B. Independent Claim 5

Independent claim 5, which comprises a method claim generally corresponding to independent claim 1, claims a method of reducing intersymbol interference from an unknown symbol of interest. See, for example, Figure 2 and p. 6, line 11 to p. 11, line 12. The claimed method despreads unknown symbols received over multiple paths of a multi-path channel. See, for example, p. 5, ll. 6 – 8 and p. 6, ll. 14 – 15. The unknown symbols include an unknown symbol of interest and an unknown interfering symbol. See, for example, p. 6, ll. 15 – 18. The claimed method further determines cross-correlations between the symbol of interest and the interfering symbol based on code cross-correlations between spreading codes for the symbol of interest and the interfering symbol. See, for example, p. 6, ll. 21 – 23, and p. 8, line 7 to p. 11, line 12. The symbol of interest is combined with the interfering symbol using weighting factors determined based on the cross-correlation to reduce intersymbol interference attributable to the interfering symbol from the symbol of interest. See, for example, p. 6, ll. 18 – 23.

C. Independent Claim 8

Independent claim 8 claims a RAKE receiver 300 comprising a plurality of RAKE fingers 320, a processor 330, and a multi-channel filter 340. See, for example, Figure 3 and p. 11 line 13 to p. 13, line 4. RAKE fingers 320 despread unknown symbols received over multiple paths of a multi-path channel, where the unknown symbols include an unknown symbol of interest and

at least one unknown interfering symbol. See, for example, p. 5, ll. 6 – 8 and p. 6, ll. 14 – 15. Processor 330 determines cross-correlations between the symbol of interest and the interfering symbol based on code cross-correlations between spreading codes for the symbol of interest and the interfering symbol. See, for example, p. 6, ll. 21 – 23, and p. 8, line 7 to p. 11, line 12. Multi-channel filter 340 reduces intersymbol interference attributable to the interfering symbol(s) from the symbol of interest based on weighting factors determined based on cross-correlations between the symbols. The multi-channel filter 340 comprises a plurality of linear transversal filters 342 and a summer 344. See, for example, Figure 4 and p. 11, ll. 19 – 22. Each transversal filter 342 is associated with a corresponding one of the plurality of RAKE fingers 320. See, for example, p. 11, ll. 20 – 21. The transversal filters 342 weight and combine the despread symbols output by the corresponding RAKE fingers 320 over a plurality of symbol periods using the weighting factors determined based on the cross-correlations between the symbols to generate a plurality of filtered output symbols. See, for example, Figure 5 and p. 12, ll. 3 – 4 and p. 12, ll. 12 – 22. Summer 344 combines the filtered output symbols to generate an estimate of the symbol of interest. See, for example, p. 12, ll. 9 – 11.

D. Independent Claim 12

Independent claim 12, which comprises a method claim generally corresponding to independent claim 8, claims a method of reducing intersymbol interference from an unknown symbol of interest. See, for example, Figure 3 and p. 11 line 13 to p. 13, line 4. The method comprises despreading multiple unknown symbols received over multiple paths of a multi-path channel. See, for example, p. 5, ll. 6 – 8 and p. 6, ll. 14 – 15. The method further comprises determining cross-correlations between the symbol of interest and at least one unknown interfering symbol based on code cross-correlations between spreading codes for the symbol of interest and the at least one interfering symbol, combining the despread symbols received over the same path during a plurality of symbol periods using weighting factors determined based on the cross-correlations between symbols to generate a plurality of filtered output symbols, and

combining the filtered output symbols to produce an estimate of the symbol of interest with reduced inter-symbol interference. See, for example, Figures 4 and 5, p. 6, ll. 21 – 23, p. 8, line 7 to p. 11, line 12, p. 11, ll. 19 – 22, and p. 12, ll. 9 – 22.

E. Independent Claim 16

Independent claim 16 claims a RAKE receiver 400 comprising a plurality of RAKE fingers 420, a processor 430, a RAKE combiner 432, and a second combiner 442. See, for example, Figure 6 and p. 13, line 5 to p. 16, line 21. RAKE fingers 420 despread unknown symbols received over multiple paths of a multi-path channel. See, for example, p. 5, ll. 6 – 8 and p. 6, ll. 14 – 15. Processor 430 determines cross-correlations between the symbol of interest and the interfering symbol based on code cross-correlations between spreading codes for the symbol of interest and the interfering symbol. See, for example, p. 6, ll. 21 – 23, and p. 8, line 7 to p. 11, line 12. RAKE combiner 432 combines the despread symbols received over different paths in the same symbol period to generate RAKE output symbols. See, for example, p. 13, ll. 12 – 15. Second combiner 442 combines successive RAKE output symbols produced over a plurality of successive symbol periods using weighting factors. See, for example, p. 13, ll. 13 – 20. The weighting factors are determined based on the cross-correlations between the symbols to reduce intersymbol interference attributable to the interfering symbol(s) from the symbol of interest. See, for example, p. 13, line 21 to p. 16, line 4.

F. Independent Claim 21

Independent claim 21, which comprises a method claim generally corresponding to independent claim 16, claims a method of reducing inter-symbol interference from an unknown symbol of interest. The claimed method despreads multiple unknown symbols from different symbol periods received over multiple paths of a multi-path channel, where the symbols include the symbol of interest and at least one unknown interfering symbol. See, for example, p. 5, ll. 6 – 8 and p. 6, ll. 14 – 18. The claimed method further determines cross-correlations between the symbol of interest and at least one interfering symbol based on code cross-correlations between

spreading codes for the symbol of interest and the interfering symbol(s). See, for example, p. 6, ll. 21 – 23, and p. 8, line 7 to p. 11, line 12. The claimed method then RAKE combines the despread symbols received over different paths during the same symbol period to generate RAKE output symbols and combines successive RAKE output symbols produced over a plurality of successive symbol periods using weighting factors. See, for example, p. 13, ll. 12 – 15. The weighting factors are determined based on the cross-correlations between the symbols to reduce intersymbol interference attributable to the interfering symbol(s) from the symbol of interest. See, for example, p. 13, line 21 to p. 16, line 4.

G. Independent Claim 24

Independent claim 24 claims a multi-code RAKE receiver 500 comprising a plurality of parallel RAKE receivers 510, a processor 530, and a multi-channel filter 540. See, for example, Figure 7 and p. 17, line 4 to p. 18, line 12. RAKE receivers 510 provide RAKE output symbols for a plurality of code channels and processor 530 determines cross-correlations between symbol spreading codes for an unknown symbol of interest and at least one unknown interfering symbol. See, for example, p. 17, line 7, p. 6, ll. 21 – 23, and p. 8, line 7 to p. 11, line 12. Multi-channel filter 540 combines the RAKE output symbols to reduce interference attributable to the interfering symbol(s) from the symbol of interest, and comprises a plurality of linear transversal filters 342 and a summer 344. See, for example, Figures, 4 and 8 and p. 18, ll. 1 – 3. Filters 342, which are each associated with a corresponding RAKE receiver 510, weight and combine the RAKE output symbols output by the corresponding RAKE receiver 510 over a plurality of symbol periods using weighting factors determined based on the cross-correlations between symbols to generate filtered output symbols. See, for example, p. 18, ll. 3 – 7. Summer 344 combines the filtered output symbols to generate an estimate of a symbol of interest. See, for example, Figures 4 and 8 and p. 18, ll. 3 – 7.

H. Independent Claim 28

Independent claim 28, which comprises a method generally corresponding to independent claim 24, claims a method of reducing interference from a symbol of interest. See, for example, Figure 7 and p. 17, line 4 to p. 18, line 12. The claimed method despreads and combines unknown symbols received over a plurality of code channels in a plurality of RAKE receivers 510 to produce RAKE output symbols, wherein each code channel comprises multiple paths. The claimed method further determines cross-correlations between different symbols based on code cross-correlations between spreading codes for the different symbols. See, for example, p. 17, line 7, p. 6, ll. 21 – 23, and p. 8, line 7 to p. 11, line 12. A plurality of RAKE output symbols from each RAKE receiver 510 are combined over a plurality of symbol periods using weighting factors determined based on the cross-correlations between the symbols to generate a filtered output symbol for each RAKE receiver 510. See, for example, Figures, 4 and 8 and p. 18, ll. 1 – 7. The plurality of filtered output symbols are combined to generate an estimate of the symbol of interest with reduced self-interference. See, for example, Figures 4 and 8 and p. 18, ll. 3 – 7.

I. Independent Claim 32

Independent claim 32 claims a RAKE receiver (200, 300, 400, 500, 510) for reducing interference from a symbol of interest. See, for example Figures 2 – 8 and the corresponding text. RAKE receiver 200, 300, 400, 500, 510 comprises a plurality of RAKE fingers 220, 320, 420, 520, a processor 230, 330, 430, 530, and a combiner 232, 340, 432, 540. RAKE fingers 220, 320, 420, 520 despread a plurality of unknown symbols received over multiple paths of a multi-path channel. See, for example, p. 5, ll. 6 – 8 and p. 6, ll. 14 – 15. Processor 230, 330, 430, 530 determines cross-correlations between different symbols based on code cross-correlations between spreading codes for the different symbols. See, for example, p. 6, ll. 21 – 23, and p. 8, line 7 to p. 11, line 12. Combiner 232, 340, 432, 540 combines the despread symbols from different spreading periods using weighting factors determined based on the

cross-correlations to generate an estimate of the symbol of interest with reduced interference. See, for example, p. 6, ll. 18 – 23.

J. Independent Claim 49

Independent claim 49, which comprises a method generally corresponding to independent claim 32, claims a method of reducing interference from a symbol of interest. The claimed method despreads unknown symbols received over at least one multi-path channel, and determines cross-correlations between different symbols based on code cross-correlations between spreading codes for the different symbols. See, for example, p. 5, ll. 6 – 8, p. 6, ll. 14 – 15 and 21 – 23, and p. 8, line 7 to p. 11, line 12. The claimed method further combines the despread symbols from different symbol periods using weighting factors determined based on the cross-correlations to generate an estimate of the symbol of interest with reduced interference. See, for example, p. 6, ll. 18 – 23.

K. Independent Claim 67

Independent claim 67 claims a wireless communication device 710 comprising at least one antenna 712 and a RAKE receiver 714, where the RAKE receiver 714 generally corresponds to the RAKE receiver of independent claim 32. See, for example, Figure 10 and p. 26, ll. 18 – 25. Antenna 712 receives unknown symbols over at least one multi-path channel. See, for example, p. 26, ll. 19 – 21. RAKE receiver 714 comprises a plurality of RAKE fingers 220, 320, 420, 520, a processor 230, 330, 430, 530, and a combiner 232, 340, 432, 540. RAKE fingers 220, 320, 420, 520 despread a plurality of unknown symbols received over at least one multi-path channel. See, for example, p. 5, ll. 6 – 8 and p. 6, ll. 14 – 15. Processor 230, 330, 430, 530 determines cross-correlations between different symbols based on code cross-correlations between spreading codes for the different symbols. See, for example, p. 6, ll. 21 – 23, and p. 8, line 7 to p. 11, line 12. Combiner 232, 340, 432, 540 combines the despread symbols from different spreading periods using weighting factors determined based on the

cross-correlations to generate an estimate of the symbol of interest with reduced interference. See, for example, p. 6, ll. 18 – 23.

L. Independent Claim 77

Independent claim 77 claims a computer readable media stored in a wireless communication device 710 that implements a method generally corresponding to independent claim 49. See Figure 10 and p. 27, ll. 1 – 7. The computer readable media stores instructions to despread unknown symbols received over at least one multi-path channel, and instructions to determine cross-correlations between different symbols based on code cross-correlations between spreading codes for the different symbols. See, for example, p. 5, ll. 6 – 8, p. 6, ll. 14 – 15 and 21 – 23, and p. 8, line 7 to p. 11, line 12. The computer readable media further stores instructions to combine the despread symbols from different symbol periods using weighting factors determined based on the cross-correlations to generate an estimate of the symbol of interest with reduced interference. See, for example, p. 6, ll. 18 – 23.

M. Independent Claim 83

Independent claim 83 claims a circuit 200, 300, 400, 500, 510 for implementing a process to reduce interference attributable to at least one interfering symbol from a symbol of interest. See, for example Figures 2 – 8 and the corresponding text. The receiver circuit 200, 300, 400, 500. 510 despreads a plurality of unknown symbols received over at least one multi-path channel. See, for example, p. 5, ll. 6 – 8 and p. 6, ll. 14 – 15. The receiver circuit 200, 300, 400, 500, 510 further determines cross-correlations between different symbols based on code cross-correlations between spreading codes for the different symbols. See, for example, p. 6, ll. 21 – 23, and p. 8, line 7 to p. 11, line 12. The receiver circuit 200, 300, 400, 500, 510 also combines the despread symbols from different spreading periods using weighting factors determined based on the cross-correlations to generate an estimate of the symbol of interest with reduced interference. See, for example, p. 6, ll. 18 – 23.

(VI.) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The examiner rejected independent claims 1, 5, 12, 16, 21, 28, 32, 49, 67, 77, and 83 under §102 as anticipated by Papasakellariou (US2001/0053177).

The examiner rejected independent claims 8 and 24 under §103 as obvious over Papasakellariou in view of Eberhardt (US5754583).

The examiner rejected dependent claims 4, 20, 31, 33 – 35, 40, 44 – 48, 50 – 52, 58, 62 – 66, 68, 71, 74 – 76, 78, 78, 81, 82, 84, 85, 87, and 89 under §102 as anticipated by Papasakellariou.

The examiner rejected dependent claims 2, 6, 9, 11, 13, 15, 17, 19, 22, 23, 25 – 27, 29, 30, 36 – 39, 41 – 43, 53 – 57, 59 – 61, 69, 70, 72, 73, 80, 86, and 88 under §103 as obvious over Papasakellariou in view of Eberhardt.

(VII.) ARGUMENT

A. The Law of Anticipation.

To establish a *prima facie* case of anticipation under 35 USC §102, every element or limitation of a claim must appear in a single prior art reference in the identical arrangement as claimed. *In re Bond*, 910 F.2d 831, 832 (Fed. Cir. 1990). There can be no anticipation unless each and every element and limitation of the claimed invention, as properly construed, is found in the single prior art reference.

1. Summary of Papasakellariou.

Papasakellariou describes an interference suppression method that performs subtractive interference cancellation after despreading but before RAKE combining (see ¶ [0020]). In particular, Papasakellariou describes determining the interfering signals, multiplying code cross-correlations by each interfering signal's complex amplitude and information symbol, and subtracting the result from the output of the despreader associated with the desired signal to cancel interference in the despread symbols (see ¶ [0009]). Subsequently, Papasakellariou RAKE combines the interference cancelled despread symbols (see ¶ [0081]). Thus,

Papasakellariou relies on known interfering symbols that are specifically determined for the interference cancellation process. Further, while Papasakellariou uses code cross-correlations as part of the interference cancellation process, Papasakellariou does not use the code cross-correlations to determine weighting factors for a multi-path despread symbol combining process, such as a RAKE combining process. See ¶s [0064] – [0081].

2. Papasakellariou does not anticipate independent claim 32.

Independent claim 32 claims a RAKE receiver that reduces interference in a symbol of interest by combining despread symbols using weighting factors determined based on code cross-correlations between spreading codes for unknown symbols, e.g., an unknown symbol of interest and an unknown interfering symbol. As such, the claimed RAKE receiver reduces interference using code cross-correlations as part of a RAKE combining process.

While Papasakellariou uses code cross-correlations as part of an interference reduction process, Papasakellariou does not use code cross-correlations as part of a despread symbol or RAKE combining process. Instead, Papasakellariou determines the interfering signals and uses the code cross-correlations to weight the determined interfering symbols. The weighted interfering symbols are then subtracted from the despread symbols output by a despreader before the despread symbols are RAKE combined. See ¶s [0009] and [0081]. Thus, Papasakellariou relies on known interfering symbols (determined in the receiver) and performs the interference cancellation before any type of despread symbol combining.

Because Papasakellariou does not rely on unknown symbols and because Papasakellariou does not combine the despread symbols using weighting factors determined based on code cross-correlations, Papasakellariou does not anticipate independent claim 32.

3. Papasakellariou does not anticipate independent claims 1, 5, 49, 67, 77, and 83.

Each of independent claims 1, 5, 49, 67, 77, and 83 explicitly require processing unknown symbols to reduce interference. Further, each independent claim explicitly requires

combining the despread symbols based on code cross-correlations, e.g., using weighting factors determined based on code cross-correlations between spreading codes for unknown symbols. As discussed above with respect to independent claim 32, Papasakellariou fails to teach either of these limitations. Thus, Papasakellariou also does not anticipate independent claims 1, 5, 49, 67, 77, and 83.

4. Papasakellariou does not anticipate independent claims 16 and 21.

Independent claims 16 and 21 explicitly require processing unknown symbols to reduce interference. As discussed above with respect to independent claim 32, Papasakellariou fails to teach this limitation. Further, independent claims 16 and 21 explicitly require a second combining operation that combines RAKE output symbols over a plurality of symbol periods using weighting factors determined based on code cross-correlations between spreading codes for unknown symbols. First, the rejection stated by the Office does not even address the second combiner. Further, as discussed above, Papasakellariou uses the code cross-correlations before RAKE combining, and therefore, does not teach using the code cross-correlations as part of a post RAKE combining process. Thus, for at least these reasons, Papasakellariou also does not anticipate independent claims 16 and 21.

5. Papasakellariou does not anticipate independent claim 12.

Independent claim 12 explicitly requires processing unknown symbols to reduce interference. Further, independent claim 12 claims combining despread symbols using weighting factors determined based on cross-correlations between symbols, which are determined based on code cross-correlations between spreading codes for the symbols. As discussed above with respect to independent claim 32, Papasakellariou fails to teach this limitation. Further, independent claim 12 explicitly requires combining filtered output symbols (the previously combined despread symbols) to further reduce interference in the symbol of interest. Not only does Papasakellariou fail to teach this second combining limitation, the Office

does not even address this limitation. Thus, Papasakellariou also does not anticipate independent claim 12.

6. Papasakellariou does not anticipate independent claim 28.

Independent claim 28 explicitly requires processing unknown symbols to reduce interference. As discussed above with respect to independent claim 32, Papasakellariou fails to teach this limitation. Further, independent claim 28 explicitly requires combining RAKE output symbols over a plurality of symbol periods using weighting factors determined based on the cross-correlations between different symbols, which are determined based on code cross-correlations between spreading codes for the different symbols, to further reduce interference in the symbol of interest. Not only does Papasakellariou fail to teach this limitation, the Office does not even address this limitation. Thus, Papasakellariou also does not anticipate independent claim 28.

7. Papasakellariou does not anticipate dependent claims 4, 20, 31, 33 – 35, 40, 44 – 48, 50 – 52, 58, 62 – 66, 68, 71, 74 – 76, 78, 78, 81, 82, 84, 85, 87, and 89.

Dependent claims 4, 20, 31, 33 – 35, 40, 44 – 48, 50 – 52, 58, 62 – 66, 68, 71, 74 – 76, 78, 78, 81, 82, 84, 85, 87, and 89 all depend directly or indirectly from independent claims 1, 5, 8, 12, 16, 21, 24, 28, 32, 49, 67, 77, and 83. Because the independent claims are allowable, the dependent claims are also allowable.

8. At least dependent claims 45 – 48, 63 – 66, 81, 82, and 87 add patentably distinct limitations to the independent claims.

Dependent claims 45 and 63 claim ways to reduce weighting factor computations when the weighting factors are computed using a correlation matrix. In particular, claims 45 – 48 and 63 – 66 claim reusing a sub-matrix of the correlation matrix for a previous symbol period in the correlation matrix of a first symbol period. Not only does Papasakellariou fail to teach this

limitation, the Office's rejection does not even address this limitation. Thus, the rejection fails and must be withdrawn.

Dependent claims 46 – 48 and 64 – 66 claim multiplying the combined despread symbols by a scaling factor to improve the reliability of the estimate of the symbol of interest, where the scaling factor may be determined based on the weighting factors (claims 47 and 65). Not only does Papasakellariou fail to teach this limitation, the Office's rejection does not even address this limitation. Thus, the rejection fails and must be withdrawn.

Dependent claim 81, 82, and 87 claim combining successive RAKE output symbols using weighting factors determined based on cross-correlations between different symbols, where the cross-correlations are determined based on code cross-correlations between spreading codes for the different symbols. Not only does Papasakellariou fail to teach this limitation, as discussed above, the Office's rejection does not even address the limitation of these claims. Thus, the rejection fails and must be withdrawn.

B. <u>The Law of Obviousness</u>.

The PTO has the burden under § 103 to establish a *prima facie* case of obviousness. To that end, the PTO must find one or more references that teach or suggest each and every limitation of the claimed invention. Then, the PTO must show some objective teaching in the prior art, or knowledge generally available to one of ordinary skill in the art, that would motivate the skilled person to modify a reference. *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1351-52 (Fed. Cir. 2001). The PTO may consider "the inferences and creative steps that a person of ordinary skilled in the art would employ." However, the PTO must provide "some articulated reasoning with some rational underpinning;" unsupported conclusory statements of obviousness are not acceptable. *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1740 – 41, 82 USPQ2d 1385, 1396 (2007).

1. **Independent claims 8 and 24 are not obvious in view of Papasakellariou and Eberhardt.**

Each of independent claims 8 and 24 explicitly require processing unknown symbols to reduce interference. Further, claims 8 and 24 both explicitly require combining the despread symbols based on code cross-correlations between spreading codes of unknown symbols, e.g., combining the despread symbols using weighting factors determined based on the code cross-correlations. The Office relies on Papasakellariou for these teachings. However, as discussed above with respect to independent claim 32, Papasakellariou fails to teach either of these limitations. Further, as discussed above, not only does Papasakellariou fails to teach the summer that combines the filtered output symbols, as required by independent claims 8 and 24, the Office fails to even address this limitation. Thus, for at least these reasons, any obviousness rejection that relies on Papasakellariou for these teachings fails as a matter of law and must be withdrawn.

2. **Dependent claims 2, 6, 9, 11, 13, 15, 17, 19, 22, 23, 25 – 27, 29, 30, 36 – 39, 41 – 43, 53 – 57, 59 – 61, 69, 70, 72, 73, 80, 86, and 88 are not obvious in view of Papasakellariou and Eberhardt.**

Dependent claims 2, 6, 9, 11, 13, 15, 17, 19, 22, 23, 25 – 27, 29, 30, 36 – 39, 41 – 43, 53 – 57, 59 – 61, 69, 70, 72, 73, 80, 86, and 88 all depend directly or indirectly from independent claims 1, 5, 8, 12, 16, 21, 24, 28, 32, 49, 67, 77, and 83. Because the independent claims are allowable, the dependent claims are also allowable.

3. **At least dependent claims 36 – 39, 41, 43, 54 – 57, 59 – 61, 69, 70, 72, and 88 add patentably distinct limitations to the independent claims.**

Each of dependent claims 36 – 39, 41 – 43, 54 – 57, 59 – 61, 69, 70, 72, 73, and 88 claim a second combining step after despread combining that combines filtered output symbols and/or RAKE combined output symbols. As discussed above with respect to claims 12, 16, 21, and 28, not only does Papasakellariou fail to teach these limitations, the Office also fails to address these limitations. Thus, the rejection fails and must be withdrawn.

C. Conclusion.

For the foregoing reasons, it is respectfully urged that the claims as presently presented are allowable over the prior art made of record, and notice of allowance is therefore respectfully requested.

(VIII.) CLAIMS APPENDIX

1. A RAKE receiver comprising:

a plurality of RAKE fingers to despread unknown symbols received over multiple paths of a multi-path channel, wherein a first one of said plurality of RAKE fingers comprises a delay corresponding to an unknown symbol of interest and a second one of said plurality of RAKE fingers comprises a delay corresponding to an unknown interfering symbol;

a processor to determine a cross-correlation between the symbol of interest and the interfering symbol based on a code cross-correlation between spreading codes for the symbol of interest and the interfering symbol; and

a combiner to combine the symbol of interest with the interfering symbol using the cross-correlation to reduce intersymbol interference attributable to the interfering symbol from the symbol of interest.

2. The RAKE receiver of claim 1 wherein said processor estimates channel coefficients for the paths of the multi-path channel and determines the cross-correlation between the symbol of interest and the interfering symbol based on the estimated channel coefficients.

3. Canceled

4. The RAKE receiver of claim 1 wherein two or more of said plurality of RAKE fingers despread the same symbol received over different paths of the multi-path channel.

5. A method of reducing intersymbol interference from an unknown symbol of interest comprising:

despreading unknown symbols received over multiple paths of a multi-path channel, wherein the unknown symbols include an unknown symbol of interest and an unknown interfering symbol;

determining a cross-correlation between the symbol of interest and the interfering symbol based on a code cross-correlation between spreading codes for the symbol of interest and the interfering symbol; and

combining the symbol of interest with the interfering symbol using weighting factors determined based on the cross-correlation to reduce the intersymbol interference attributable to the interfering symbol from the symbol of interest.

6. The method of claim 5 wherein determining the cross-correlation between the symbol of interest and the interfering symbol comprises estimating channel coefficients for the multiple paths of the multi-path channel and determining the cross-correlation based on the estimated channel coefficients.

7. Canceled

8. A RAKE receiver comprising:

a plurality of RAKE fingers to despread unknown symbols received over multiple paths of a multi-path channel, wherein the unknown symbols include an unknown symbol of interest and at least one unknown interfering symbol;

a processor to determine cross-correlations between the symbol of interest and the at least one interfering symbol based on code cross-correlations between spreading codes for the symbol of interest and the at least one interfering symbol; and

a multi-channel filter to reduce intersymbol interference attributable to the at least one interfering symbol(s) from the symbol of interest by combining despread symbols from different symbol periods output by said plurality of RAKE fingers using weighting factors determined based on the cross-correlations between the symbols, said multi-channel filter comprising:

a plurality of linear transversal filters, each of which is associated with a corresponding one of the plurality of RAKE fingers, to weight and combine the despread symbols output by the corresponding one of the plurality of RAKE fingers over a plurality of symbol periods using weighting factors determined based on the cross-correlations between the symbols to generate a plurality of filtered output symbols; and

a summer to combine the plurality of filtered output symbols to generate an estimate for the symbol if interest.

9. The RAKE receiver of claim 8 wherein said processor further estimates channel coefficients for the multiple paths of the multi-path channel and determines the cross-correlations between the symbol of interest and the at least one interfering symbol based on the estimated channel coefficients.

10. Canceled

11. The RAKE receiver of claim 8 wherein each of said linear transversal filter comprises:

a tapped delay line comprising a series of delay elements to delay the despread symbols output by the corresponding one of the plurality of RAKE fingers;

a plurality of weighting elements to weight corresponding ones of the delayed despread symbols by weighting factors determined based on the cross-correlations to generate weighted output symbols; and

a summer to combine the weighted output symbols to generate the filtered output symbol.

12. A method of reducing intersymbol interference from an unknown symbol of interest comprising:

despreading multiple unknown symbols received over multiple paths of a multi-path channel;

determining cross-correlations between the symbol of interest and at least one unknown interfering symbol based on code cross-correlations between spreading codes for the symbol of interest and the at least one interfering symbol;

combining the despread symbols received over the same path during a plurality of symbol periods using weighting factors determined based on the cross-correlations between symbols to generate a plurality of filtered output symbols; and

combining the filtered output symbols to produce an estimate of the symbol of interest with reduced inter-symbol interference.

13. The method of claim 12 wherein determining the cross-correlations between symbols for the symbol of interest and the at least one interfering symbol comprises estimating channel coefficients for the multiple paths of the multi-path channel and determining the cross-correlations between the symbols based on the estimated channel coefficients.

14. Canceled

15. The method of claim 12 wherein combining the despread symbols received over the same path during a plurality of symbol periods using weighting factors determined based on the cross-correlations between the symbols to generate a plurality of filtered output symbols comprises:

delaying the despread symbols received over the same path in a tapped delay line to generate a plurality of delayed symbols;

weighting each of the plurality of delayed symbols using the weighting factors determined based on the cross-correlations between symbols to generate a plurality of weighted symbols; and

summing the weighted symbols to generate each of the plurality of filtered output symbols.

16. A RAKE receiver comprising:

a plurality of RAKE fingers to despread unknown symbols received over multiple paths of a multi-path channel;

a processor to determine cross-correlations between symbols for a symbol of interest and at least one interfering symbol based on code cross-correlations between spreading codes for the symbol of interest and the at least one interfering symbol;

a RAKE combiner to combine the despread symbols received over different paths in the same symbol period to generate RAKE output symbols; and

a second combiner to combine successive RAKE output symbols produced over a plurality of successive symbol periods using weighting factors determined based on the cross-correlations between the symbols to reduce intersymbol

interference attributable to the at least one interfering symbol from the symbol of interest.

17. The RAKE receiver of claim 16 wherein said processor estimates channel coefficients for the multiple paths of the multi-path channel and determines the cross-correlations between the symbol of interest and the at least one interfering symbol based on the estimated channel coefficients.

18. Canceled

19. The RAKE receiver of claim 16 wherein said second combiner comprises:

a tapped delay line comprising a series of delay elements to delay successive ones of the RAKE output symbols to generate a series of delayed output symbols;

a plurality of weighting elements to weight corresponding ones of the delayed output symbols using the weighting factors determined based on the cross-correlations between the symbols to generate weighted output symbols; and

a summer to combine the weighted output symbols to generate an estimate for the symbol of interest.

20. The RAKE receiver of claim 16 wherein the RAKE combiner comprises a G-RAKE combiner.

21. A method of reducing intersymbol interference from an unknown symbol of interest comprising:

despreading multiple unknown symbols from different symbol periods received over multiple paths of a multi-path channel, said multiple symbols including the symbol interest and at least one unknown interfering symbol;

determining cross-correlations between the symbol of interest and the at least one interfering symbol based on code cross-correlation between spreading codes for the symbol of interest and the at least one interfering symbol;

RAKE combining the despread symbols received over different paths during the same symbol period to generate RAKE output symbols; and

combining successive RAKE output symbols produced over a plurality of successive symbol periods using weighting factors determined based on the cross-correlations between the symbols to reduce intersymbol interference attributable to the at least one interfering symbol from the symbol of interest.

22. The method of claim 21 wherein determining the cross-correlations between the symbol of interest and the at least one interfering symbol comprises estimating channel coefficients for the multiple paths of the multi-path channel and determining the cross-correlations between the symbols based on the estimated channel coefficients.

23. The method of claim 21 wherein combining successive RAKE output symbols produced over a plurality of successive symbol periods comprises:

delaying successive RAKE output symbols in a tapped delay line to generate a plurality of delayed output symbols;

weighting each of the plurality of delayed output symbols using a weighting factor determined based on the cross-correlations between the symbols to generate a plurality of weighted output symbols; and

summing the plurality of weighted output symbols to generate an estimate for the symbol of interest.

24. A multi-code RAKE receiver comprising:

a plurality of parallel RAKE receivers providing RAKE output symbols for a plurality of code channels;

a processor to determine cross-correlations between symbol spreading codes for an unknown symbol of interest and at least one unknown interfering symbol;

a multi-channel filter to combine the RAKE output symbols to reduce interference attributable to the at least one interfering symbol from the symbol of interest, said multi-channel filter comprising:

a plurality of linear transversal filters, each of which is associated with a corresponding one of said plurality of parallel RAKE receivers, to weight and combine RAKE output symbols output by the corresponding RAKE receiver over a plurality of symbol periods using weighting factors determined based on the cross-correlations between the symbols to generate filtered output symbols; and

a summer to combine the filtered output symbols to generate an estimate of a symbol of interest.

25. The multi-code RAKE receiver of claim 24 wherein the plurality of RAKE receivers comprise a plurality of G-RAKE receivers.

26. The multi-code RAKE receiver of claim 24 wherein said processor determines the cross-correlations between the symbols based on channel coefficients corresponding to the multiple paths of the multi-path channel.

27. The multi-code RAKE receiver of claim 24 wherein each linear transversal filter comprises:

a tapped delay line comprising a series of delay elements to delay successive RAKE output symbols to generate delayed output symbols;

a plurality of weighting elements to weight corresponding ones of the delayed output symbols by the weighting factors determined based on the cross-correlations between the symbols to generate weighted output symbols; and

a summer to combine the weighted output symbols.

28. A method of reducing interference from a symbol of interest comprising:

despreading and combining unknown symbols received over a plurality of code channels in a plurality of RAKE receivers to produce RAKE output symbols, wherein each code channel comprises multiple paths;

determining cross-correlations between different symbols based on code cross-correlation between spreading codes for the different symbols;

combining a plurality of RAKE output symbols output from each RAKE receiver over a plurality of symbol periods using weighting factors determined based on the cross-correlations between the symbols to generate a filtered output symbol for each RAKE receiver; and

combining the plurality of filtered output symbols to generate an estimate of the symbol of interest with reduced self-interference.

29. The method of claim 28 wherein determining cross-correlations between different symbols comprises estimating channel coefficients for each path of each code channel and

determining the cross-correlations between the symbols based on the estimated channel coefficients.

30. The method of claim 28 wherein combining a plurality of the RAKE output symbols output from each RAKE receiver over the plurality of symbol periods using weighting factors determined based on the cross-correlations between the symbols to generate the plurality of filtered output symbols, comprises:

delaying the RAKE output symbols in a tapped delay line to generate a plurality of delayed output symbols;

weighting the delayed output symbols by weighting factors determined based on the cross-correlations between the symbols to generate a plurality of weighted symbols; and

summing the plurality of weighted symbols.

31. The method of claim 28 wherein despreading and combining symbols received over a plurality of code channels is performed in G-RAKE receivers.

32. A RAKE receiver for reducing interference from a symbol of interest comprising:

a plurality of RAKE fingers to despread a plurality of unknown symbols received over multiple paths of a multi-path channel;

a processor to determine cross-correlations between different symbols based on code cross-correlations between spreading codes for the different symbols; and

a combiner to combine despread symbols from different symbol periods using weighting factors determined based on the cross-correlations between the different symbols to generate an estimate of the symbol of interest with reduced interference.

33. The RAKE receiver of claim 32 wherein a first one of said plurality of RAKE fingers has a delay corresponding to the symbol of interest and a second one of said plurality of RAKE fingers has a delay corresponding to an interfering symbol.

34. The RAKE receiver of claim 33 wherein said processor determines the cross-correlations based on a cross-correlation determined between a symbol spreading code for the symbol of interest and a symbol spreading code for the interfering symbol.

35. The RAKE receiver of claim 34 wherein the combiner combines the symbol of interest with the interfering symbol using the cross-correlation to reduce the interference attributable to the interfering symbol from the symbol of interest.

36. The RAKE receiver of claim 32 wherein the combiner comprises a multi-channel filter comprising:

a plurality of linear transversal filters, each of which is associated with a corresponding one of the plurality of RAKE fingers, to weight and combine despread symbols output by the corresponding RAKE fingers over a plurality of symbol periods using weighting factors determined based on the cross-correlations between the different symbols to generate a plurality of filtered output symbols; and

a filter combiner to combine the filtered output symbols.

37. The RAKE receiver of claim 36 wherein each linear transversal filter comprises:

a tapped delay line comprising a series of delay elements to delay the successive symbols output by the corresponding RAKE fingers to generate a set of delayed symbols during each symbol period;

a plurality of weighting elements to weight corresponding ones of the delayed symbols by weighting factors determined based on the cross-correlations to generate weighted output symbols; and

a summer to combine the weighted output symbols to generate each of the plurality of filtered output symbols.

38. The RAKE receiver of claim 32 wherein the combiner comprises:

a RAKE combiner to RAKE combine despread symbols received over different paths in the same symbol period to generate a combined RAKE output symbol for each path; and

a linear transversal filter to combine successive RAKE output symbols produced over a plurality of successive symbol periods using weighting factors determined based on the cross-correlations between the different symbols to reduce the interference attributable to the interfering symbols from the symbol of interest to generate the estimate of the symbol of interest.

39. The RAKE receiver of claim 38 wherein each linear transversal filter comprises:

a tapped delay line comprising a series of delay elements to delay successive RAKE output symbols to generate a plurality of delayed RAKE output symbols during each symbol period;

a plurality of weighting elements to weight delayed RAKE output symbols by weighting factors determined based on the cross-correlations between the different symbols to generate weighted RAKE output symbols; and

a summer to combine the weighted RAKE output symbols.

40. The RAKE receiver of claim 32 wherein the RAKE fingers are divided into two or more groups, and wherein each group of RAKE fingers despreads symbols received over a different code channel.

41. The RAKE receiver of claim 40 wherein said combiner comprises:

a RAKE combiner for each group of RAKE fingers to combine the RAKE finger output symbols within the corresponding group to generate RAKE output symbols; and

a multi-channel filter to combine the RAKE output symbols to reduce the interference attributable to at least one interfering symbol from the symbol of interest, said multi-channel filter comprising:

a plurality of linear transversal filters, each of which is associated with one of the code channels, to weight and combine successive RAKE output symbols output from a corresponding RAKE combiner over a plurality of symbol periods using weighting factors determined based on the cross-correlations between the different symbols to generate filtered output symbols; and

a summer to combine the filtered output symbols.

42. RAKE receiver of claim 41 wherein said RAKE combiners are G-RAKE combiners.

43. The RAKE receiver of claim 42 wherein each linear transversal filter comprises:

a tapped delay line comprising a series of delay elements to delay successive RAKE output symbols output by the corresponding RAKE combiner to generate a plurality of delayed output symbols;

a plurality of weighting elements to weight the delayed output symbols by weighting factors determined based on the cross-correlations between the different symbols to generate weighted output symbols; and

a summer to combine the weighted output symbols.

44. The RAKE receiver of claim 32 wherein the cross-correlations between the different symbols form a correlation matrix used to determine the weighting factors.

45. The RAKE receiver of claim 44 wherein the correlation matrix of a first symbol period reuses a sub-matrix of the correlation matrix of a previous symbol period.

46. The RAKE receiver of claim 32 wherein the combiner further determines a scaling factor based on the channel estimate and multiplies the combined despread symbols by the scaling factor to improve a reliability of the estimate of the symbol of interest.

47. The RAKE receiver of claim 46 wherein the scaling factor is based on the weighting factors.

48. The RAKE receiver of claim 46 wherein the RAKE receiver receives traffic and pilot channel signals and wherein the scaling factor is based on a ratio of a power allocated to the traffic channel signal to a power allocated to the pilot channel signal.

49. A method of reducing interference from a symbol of interest comprising:

despreading unknown symbols received over at least one multi-path channel;

determining cross-correlations between different symbols based on code cross-correlations between spreading codes for the different symbols; and

combining the despread symbols from different symbol periods using weighting factors determined based on the cross-correlations between different symbols to generate an estimate of the symbol of interest with reduced interference.

50. The method of claim 49 wherein despreading the symbols received over the at least one multi-path channel comprises despreading the symbol of interest and at least one interfering symbol.

51. The method of claim 50 wherein determining code cross-correlations between the spreading codes for the different symbols comprises determining a code cross-correlation between a symbol spreading code for the symbol of interest and a symbol spreading code for the at least one interfering symbol.

52. The method of claim 51 wherein combining the despread symbols from different symbol periods using weighting factors determined based on the cross-correlations between the symbol spreading codes comprises combining the symbol of interest with the at least one interfering symbol.

53. The method of claim 49 wherein combining the despread symbols from different symbol periods using weighting factors determined based on the cross-correlations between the different symbols comprises filtering the despread symbols in a multi-channel filter.

54. (Original) The method of claim 53 wherein filtering the despread symbols in the multi-channel filter comprises:

filtering each of the despread symbols in a linear transversal filter to combine despread symbols received over a plurality of symbol periods using weighting factors

determined based on the cross-correlations between the different symbols to generate a plurality of filtered output symbols; and

summing the plurality of filtered output symbols.

55. The method of claim 54 wherein filtering each of the despread symbols in a linear transversal filter comprises:

delaying the despread symbol received over the same path in a tapped delay line to generate a plurality of delayed symbols;

weighting each of the plurality of delayed symbols using a weighting factor determined based on the cross-correlations between the different symbols to generate a plurality of weighted symbols; and

summing the plurality of weighted symbols to generate each of the plurality of filtered output symbols.

56. The method of claim 49 wherein combining the despread symbols from different symbol periods using weighting factors determined based on the cross-correlations between the different symbols comprises:

RAKE combining the despread symbols received over different paths during the same symbol period to generate a combined RAKE output symbol during each symbol period; and

combining successive RAKE output symbols produced over a plurality of successive symbol periods using weighting factors determined based on the cross-correlations between the different symbols.

57. The method of claim 56 wherein combining successive RAKE output symbols produced over a plurality of symbol periods comprises:

delaying the RAKE output symbol in a tapped delay line to generate a plurality of delayed output symbols during each symbol period;

weighting the delayed output symbols using weighting factors determined based on the cross-correlations between the different symbols to generate a plurality of weighted output symbols; and

summing the plurality of weighted output symbols.

58. The method of claim 49 wherein despreading the symbols received over the at least one multi-path channel comprises despreading symbols received over multiple paths of multiple code channels.

59. The method of claim 58 wherein combining the despread symbols from different symbol periods using weighting factors determined based on the cross-correlations between the different symbols comprises:

RAKE combining despread symbols received over each code channel to generate a combined RAKE output symbol for each code channel; and

combining the RAKE output symbols in a multi-channel filter.

60. The method of claim 59 wherein combining the RAKE output symbols in the multi-channel filter comprises:

filtering the RAKE output symbols for each code channel over a plurality of symbol periods in a linear transversal filter using weighting factors determined based on the cross-correlations between the different symbols to generate a filtered output symbol for each code channel during each symbol period; and

combining the filtered output symbols to generate the estimate of the symbol of interest.

61. The method of claim 60 wherein filtering the combined RAKE output symbols for each code channel over the plurality of symbol periods in the linear transversal filter using weighting factors determined based on the cross-correlations between the different symbols to generate a filtered output symbol for each code channel during each symbol period comprises:

delaying each of the RAKE output symbols in a tapped delay line to generate a plurality of delayed output symbols during each symbol period;

weighting the delayed output symbols by the weighting factors determined based on the cross-correlations between the different symbols to generate a plurality of weighted output symbols; and

summing the plurality of weighted output symbols.

62. The method of claim 49 wherein combining the despread symbols from different symbol periods using weighting factors determined based on the cross-correlations between different symbols comprises combining the despread symbols from different symbol periods using weighting factors determined based on a correlation matrix formed from the cross-correlations between different symbols.

63. The method of claim 62 further comprising reusing a sub-matrix of the correlation matrix of a first symbol period to form the correlation matrix of a second symbol period.

64. The method of claim 49 further comprising determining a scaling factor based on a channel estimate of at least one multi-path channel and multiplying the combined despread symbols by the scaling factor to improve a reliability of the estimate of the symbol of interest.

65. The method of claim 64 further comprises determining the scaling factor based on the weighting factors.

66. The method of claim 64 wherein the RAKE receiver receives traffic and pilot channel signals, the method further comprising determining the scaling factor based on a ratio of a power allocated to the traffic channel signal to a power allocated to a pilot channel signal.

67. A wireless communication device comprising:

at least one antenna to receive unknown symbols over at least one multi-path channel; and

a RAKE receiver to reduce interference attributable to unknown interfering symbols from an unknown symbol of interest, the RAKE receiver comprising:

a plurality of RAKE fingers to despread the unknown symbols received over the at least one multi-path channel;

a processor to determine cross-correlations between different symbols based on code cross-correlations between spreading codes for the different symbols; and

a combiner to combine despread symbols from different symbol periods using weighting factors determined based on the cross-correlations between the different symbols to generate an estimate of a symbol of interest with reduced interference.

68. The wireless communication device of claim 67 wherein the combiner comprises a RAKE combiner to RAKE combine symbols received over a plurality of symbol periods.

69. The wireless communication device of claim 67 wherein said combiner comprises a multi-channel filter comprising:

a plurality of linear transversal filters, each of which is associated with a corresponding one of the plurality of RAKE fingers, to weight and combine despread symbols output by the corresponding RAKE finger over a plurality of symbol periods using the weighting factors determined based on the cross-correlations between the different symbols to generate a plurality of filtered output symbols; and

a filter combiner to combine the filtered output symbols.

70. The wireless communication device of claim 67 wherein the combiner comprises:

a RAKE combiner to RAKE combine despread symbols received over different paths in the same symbol period to generate a combined RAKE output symbol for each path in each symbol period; and

a linear transversal filter to combine successive RAKE output symbols produced over a plurality of successive symbol periods using weighting factors determined based on the cross-correlations between the different symbols to generate the estimate of the symbol of interest.

71. The wireless communication device of claim 67 wherein the RAKE fingers are divided into two or more groups, and wherein each group of RAKE fingers despreads symbols received over a different code channel.

72. The wireless communication device of claim 71 wherein said combiner comprises:

a RAKE combiner for each group of RAKE fingers combines the RAKE finger output symbols within the corresponding group to generate RAKE output symbols; and

a multi-channel combiner to combine the RAKE output symbols to reduce the interference attributable to at least one interfering symbol from the symbol of interest, said multi-channel filter comprising:

a plurality of linear transversal filters, each of which is associated with one of the code channels, to weight and combine successive RAKE output symbols output from a corresponding RAKE combiner over a plurality of symbol periods using weighting factors determined based on the cross-correlations between the different symbols to generate filtered output symbols; and

a summer to combine the filtered output symbols.

73. The wireless communication device of claim 72 wherein the RAKE combiner for each code channel comprises a G-RAKE combiner.

74. The wireless communication device of claim 67 wherein the processor determines code cross-correlations between spreading codes for different symbols by determining code cross-correlations between a symbol spreading code for the symbol of interest and a symbol spreading code for at least one interfering symbol.

75. The wireless communication device of claim 67 wherein the wireless communication device comprises a mobile terminal.

76. The wireless communication device of claim 67 wherein the wireless communication device comprises a base station.

77. A computer readable media stored in a wireless communication device for storing a set of instructions to reduce interference attributable to at least one interfering symbol from a symbol of interest, the set of instructions comprising:

instructions to despread unknown symbols received over at least one multi-path channel;

instructions to determine cross-correlations between different symbols based on code cross-correlations between spreading codes for the different symbols; and

instructions to combine the despread symbols from different symbol periods using weighting factors determined based on the cross-correlations between the different symbols to generate an estimate of a symbol of interest with reduced interference.

78. The program of claim 77 wherein the instructions to determine the code cross-correlations between the spreading codes for different symbols comprises instructions to determine code cross-correlations between a symbol spreading code for the symbol of interest and a symbol spreading code for at least one interfering symbol.

79. The program of claim 78 wherein the instructions to combine the despread symbols from different symbol periods using weighting factors determined based on the cross-correlations between the different symbols comprises instructions to combine the symbol of interest with the at least one interfering symbol.

80. The program of claim 77 wherein the instructions to combine the despread symbols from different symbol periods using weighting factors determined based on the cross-correlations between the different symbols comprises filtering the despread symbols in a multi-channel filter.

81. The program of claim 77 wherein the instructions to combine the despread symbols from different symbol periods using weighting factors determined based on the cross-correlations between the different symbols comprises:

instructions to RAKE combine the despread symbols received over different paths during the same symbol period to generate a combined RAKE output symbol during each symbol period; and

instructions to combine successive RAKE output symbols produced over a plurality of successive symbol periods using weighting factors determined based on the cross-correlations between the different symbols.

82. The program of claim 77 wherein the instructions to combine the despread symbols from different symbol periods using weighting factors determined based on the cross-correlations between the different symbols comprises:

instructions to RAKE combine despread symbols received over each code channel to generate a combined RAKE output symbol for each code channel; and

instructions to combine the RAKE output symbols in a multi-channel filter.

83. A circuit to implement a process to reduce interference attributable to at least one interfering symbol from a symbol of interest, the circuit comprising:

a receiver circuit to:

despread unknown symbols received over at least one multi-path channel;

determine cross-correlations between different symbols based on code cross-correlations between spreading codes for the different symbols; and

combine the despread symbols from different symbol periods using weighting factors determined based on the cross-correlations between the different

symbols to generate an estimate of a symbol of interest with reduced interference.

84. The circuit of claim 83 wherein the receiver circuit determines the code cross-correlations between the spreading codes for the different symbols by determining code cross-correlations between a symbol spreading code for the symbol of interest and a symbol spreading code for at least one interfering symbol.

85. The circuit of claim 84 wherein the receiver circuit combines the despread symbols from different symbol periods using weighting factors determined based on the cross-correlations between the different symbols by combining the symbol of interest with the at least one interfering symbol.

86. The circuit of claim 83 wherein the receiver circuit combines the despread symbols from different symbol periods using weighting factors determined based on the cross-correlations between the different symbols by filtering the despread symbols in a multi-channel filter.

87. The circuit of claim 83 wherein the receiver circuit combines the despread symbols from different symbol periods using weighting factors determined based on the cross-correlations between the different symbols by:

RAKE combining the despread symbols received over different paths during the same symbol period to generate a combined RAKE output symbol during each symbol period; and

combining successive RAKE output symbols produced over a plurality of successive symbol periods using weighting factors determined based on the cross-correlations between the different symbols.

88. The circuit of claim 83 wherein the receiver circuit combines the despread symbols from different symbol periods using weighting factors determined based on the cross-correlations between the different symbols by:

RAKE combining despread symbols received over each code channel to generate a combined RAKE output symbol for each code channel; and

combining the RAKE output symbols in a multi-channel filter.

89. The circuit of claim 83 wherein the circuit comprises an application specific integrated circuit.

(IX.) EVIDENCE APPENDIX

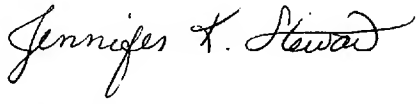
None.

(X.) RELATED PROCEEDINGS APPENDIX

None.

Respectfully submitted,

COATS & BENNETT, P.L.L.C.



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